An example of food, feed, energy and C removal in degraded land:

how the energy sector can support the transition, enabling more sustainable agriculture.

David Chiaramonti

Politecnico di Torino

RE·CORD

Call: LCE-20-2016-2017 Topic: Aviation Biofuels
Project title: Advanced sustainable BIOfuels for Aviation BIO4A

PROJECT CONCEPT

Accelerate SAF deployment, enabling commercial production.
Supporting the accomplishment of pre-commercial plant(s) for advanced biofuels for aviation based on sustainable biomass feedstock.

PROJECT OBJECTIVES

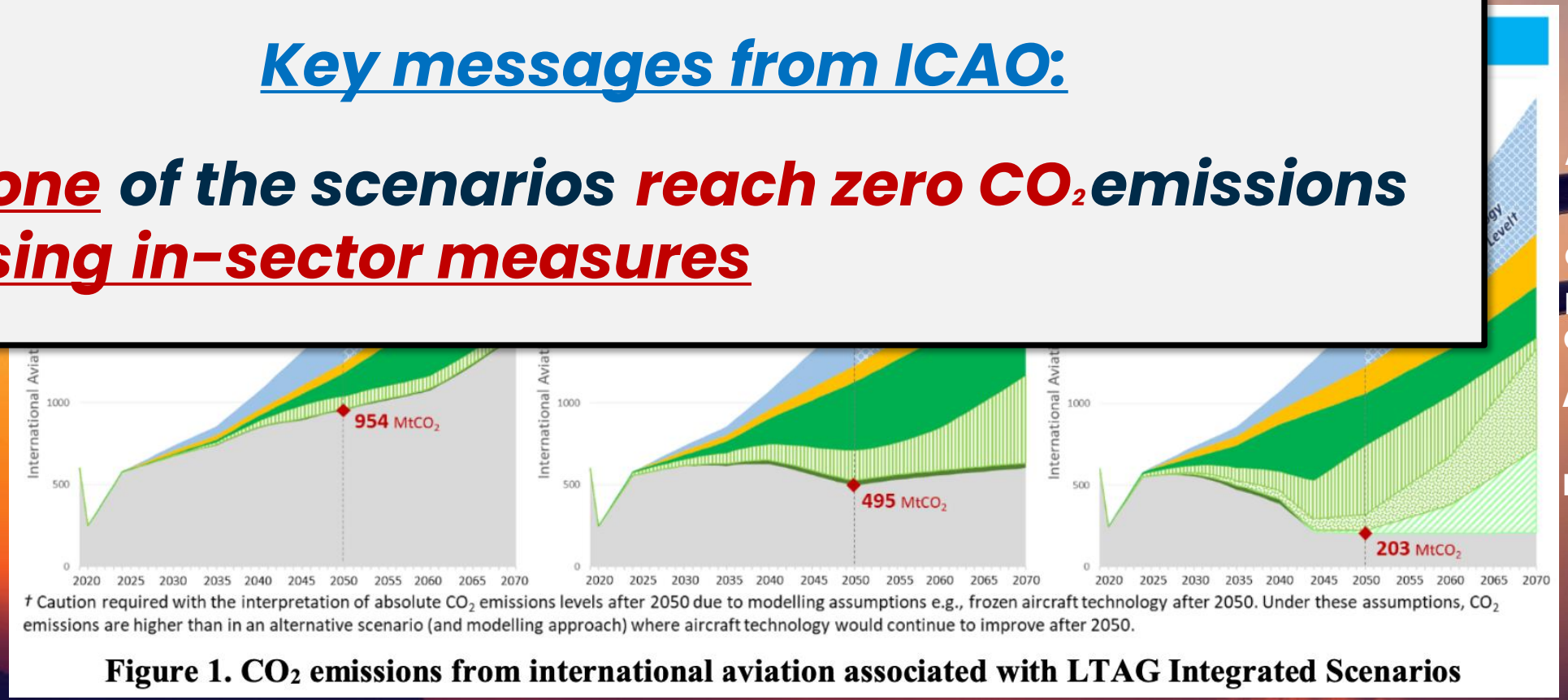
1) To bring HEFA to full commercial scale in new plant using residual lipids (Used Cooking Oil – UCO) → **1000 t SAF**;
2) To investigate **alternative supply of sustainable feedstocks recovering EU MED marginal land for drought resistant crop production**;
3) To test the entire chain and logistic at industrial scale, and assess environmental performances;
4) Positive GHG and energy balance expected → **Cneg SAF demonstrated**

- ***ICAO, 2017*** → **142** Mt CAF at 2010 → 570-**860** Mt at 2050 (Intern. Aviation) + 400-600 % !!
- **100% CAF substitution (MAX scenario)** – **170 new biorefineries each year** from **2020 to 2050** (15-60 $B/y
- **MAX** would **reduce CO_2 emission by 63%**

LTAG Scenarios *(ICAO, March 2022)*

Key messages from ICAO:

1. ***None*** ***of the scenarios reach zero CO_2 emissions***
2. ***using in-sector measures***



† Caution required with the interpretation of absolute CO_2 emissions levels after 2050 due to modelling assumptions e.g., frozen aircraft technology after 2050. Under these assumptions, CO_2 emissions are higher than in an alternative scenario (and modelling approach) where aircraft technology would continue to improve after 2050.

Figure 1. CO_2 emissions from international aviation associated with LTAG Integrated Scenarios

- ***Aircraft Techn:*** *Advanced tube and wing, unconventional airframe/propulsion concept aircraft, non-drop-in fuels such as battery electric etc*
- ***Operations****: improvements in the performance of flights across all phases*

Aircraft Technology

Operations

Biomass SAF
Gaseous Waste SAF

Atmospheric CO2 SAF

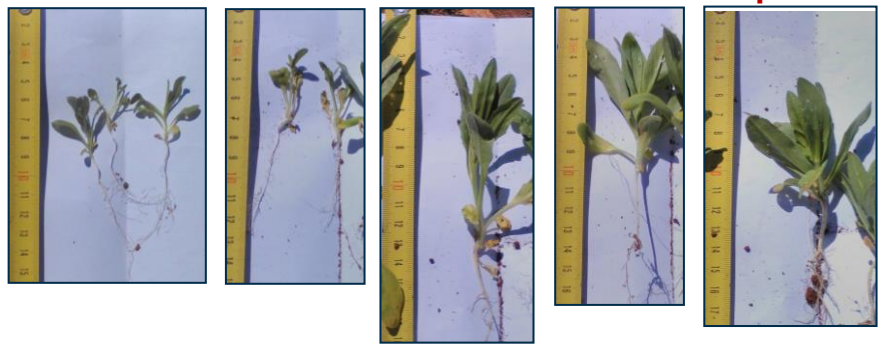
Hydrogen

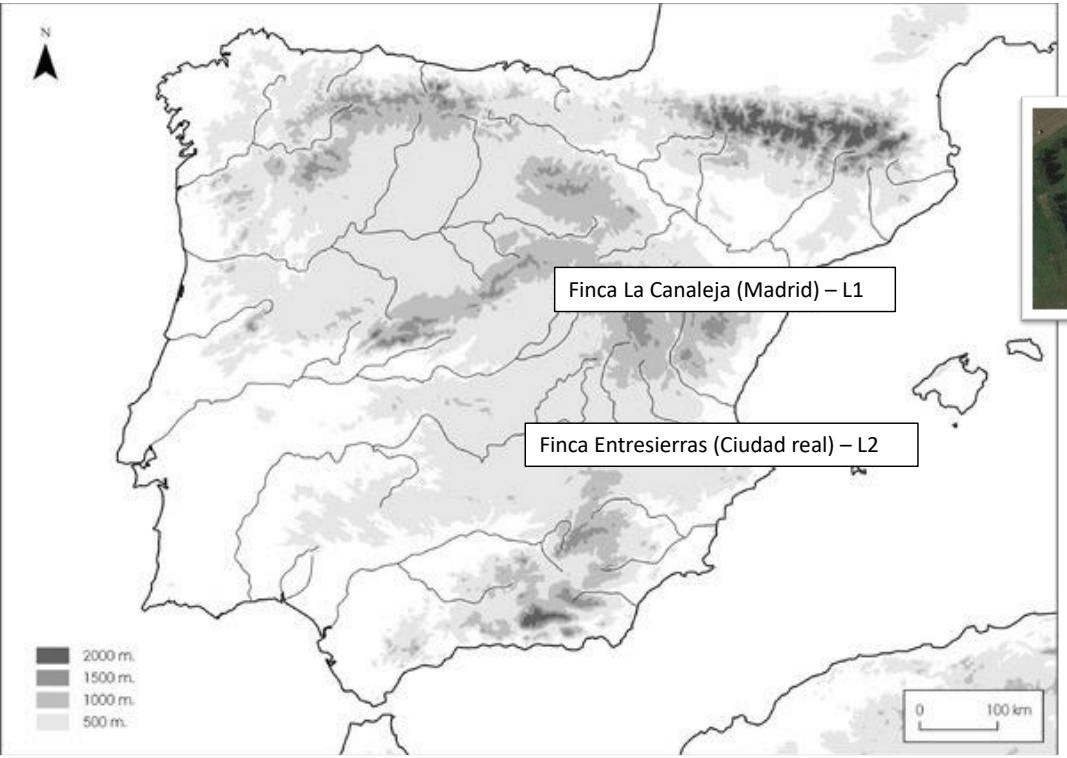
FOOD, FEED AND ENERGY (FUELS)

Reverse ILUC approach:
Barley & Camelina in recovered soil in Spain.

Food/feed otherwise not produced.

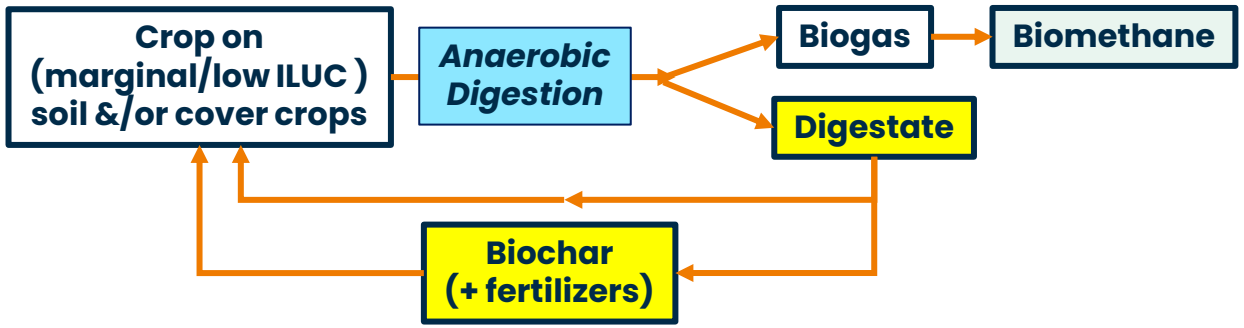
No fertilization | Mineral fertilization | 100% Compost | 100% Biochar | Co-composted Biochar+ Compost 10%

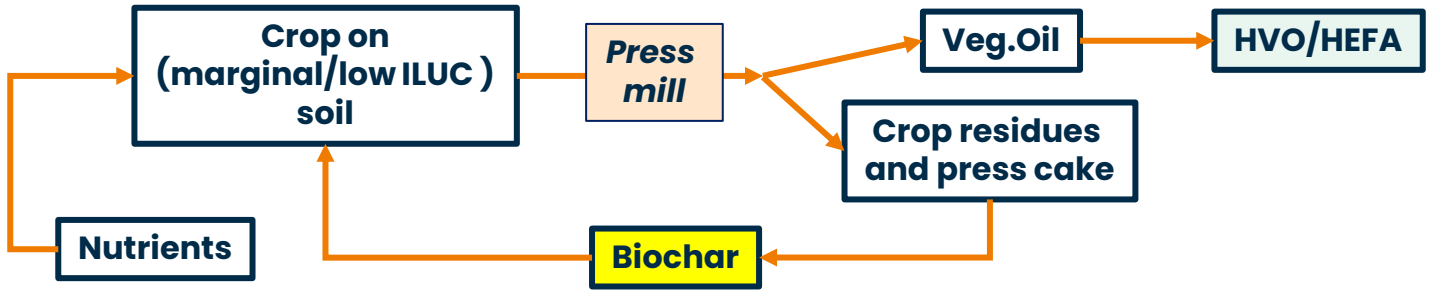




“Biofuels Done Right” can be Carbon Negative and support farming in EU

- **Carbon NEUTRAL vs Carbon NEGATIVE: renewable BIOfuels can be C-Negative**
- **Biogas Done Right and Digestate, and/or Pyrolysis to Biochar are some examples**
- **Fully deploying REDII-IR (Esca factor → C in soil in GHG assessment)**





EU actions on Carbon Removal and Sust.Fuels + Expert Group on Carbon Removal Certification (DG Clima)

EUROPEAN COMMISSION

Brussels, 15.12.2021
COM(2021) 800 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL Sustainable Carbon Cycles.

EC 15.12.2021, COM(2021) 800 final

EN EN

EUROPEAN COMMISSION

Brussels, 30.11.2022
COM(2022) 672 final

2022/0394 (COD)

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a Union certification framework for carbon removals.

EC 30.11.2022, COM(2022) 672 final

EN EN

27.6.2022 EN Official Journal of the European Union L 168/1

II

(Non-legislative acts)

REGULATIONS

COMMISSION IMPLEMENTING REGULATION (EU) 2022/996 of 14 June 2022

on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land- use change-risk criteria

(1) Directive (EU) 2018/2001 expands the role of voluntary schemes to include the certification of the compliance of biomass fuels with sustainability and greenhouse gas (GHG) emissions saving criteria and the compliance of renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuels with the respective GHG emissions saving criteria. Furthermore, the voluntary schemes can be used to certify biofuels, bioliquids and biomass fuels with low indirect land-use change-risk.

(2) In order to establish whether biofuels, bioliquids, biomass fuels, renewable gaseous and liquid transport fuels of non-biological origin and recycled carbon fuels comply with the requirements of Directive (EU) 2018/2001, the correct and harmonised functioning of voluntary schemes is essential. Harmonised rules should therefore be established, to apply across the certification system, bringing about the necessary legal certainty on the rules applicable to economic operators and voluntary schemes.

(3) With a view to minimising the administrative burden, the implementing rules should be proportionate and limited to what is required to ensure that compliance with the sustainability and GHG emissions saving criteria and other requirements is verified in an adequate and harmonised manner that minimises the risk of fraud to the greatest extent possible. The implementing rules should therefore not be considered as a comprehensive standard but rather as minimum requirements. The voluntary schemes may accordingly complement these rules as appropriate.

(4) Economic operators may decide at any time to participate in a different voluntary scheme. However, in order to prevent an economic operator that has failed an audit under one scheme from immediately applying for certification under another scheme, all schemes receiving an application from an economic operator should require that operator to supply information about whether it failed an audit in the previous 5 years. This should also apply to situations where the economic operator has a new legal personality but remains the same in substance, so that minor or purely formal changes, for instance, in the governance structure or the scope of activities, do not exempt the new economic operator from such a rule.

(1) OJ L 328, 21.12.2018, p. 82.

EU on Carbon and Sust.Fuels: REDII – IA

(a) greenhouse gas emissions from the production and use of biofuels shall be calculated as:

$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr},$$

where

E	=	total emissions from the use of the fuel;
e_{ec}	=	emissions from the extraction or cultivation of raw materials;
e_l	=	annualised emissions from carbon stock changes caused by land-use change;
e_p	=	emissions from processing;
e_{td}	=	emissions from transport and distribution;
e_u	=	emissions from the fuel in use;
e_{sca}	=	emission savings from soil carbon accumulation via improved agricultural management;
e_{ccs}	=	emission savings from CO_2 capture and geological storage; and
e_{ccr}	=	emission savings from CO_2 capture and replacement.

$$e_{sca} = (CS_A - CS_R) \times 3{,}664 \times 10^6 \times \frac{1}{n} \times \frac{1}{P} \text{-} e_f$$

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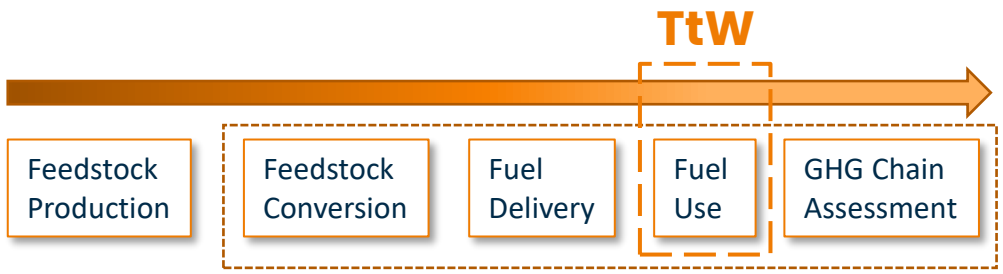
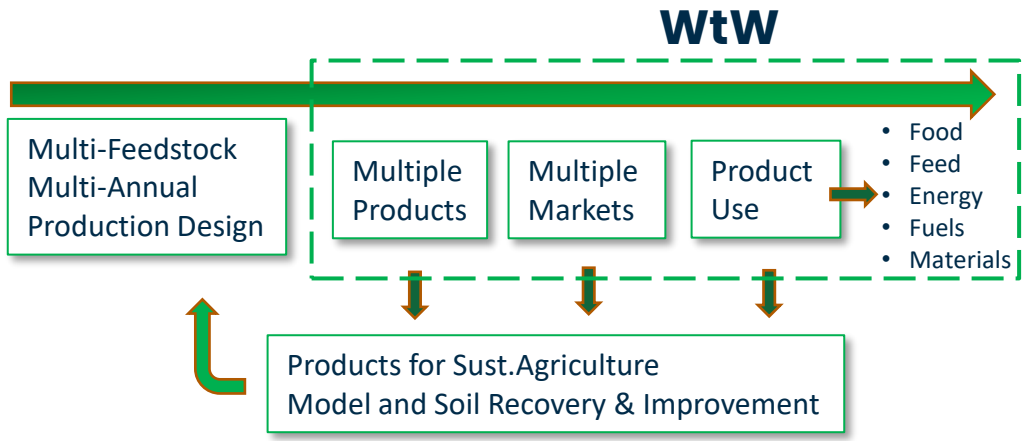
Enabling more sustainable agriculture & Negative Carbon through Sustainable Biofuel chains



How to make this linear biofuel thinking sustainable (GHG) enough?



Which opportunities Bioenergy & Bioeconomy offer to sequester Carbon and make agriculture more sustainable (beyond GHGs, towards SDGs)?

From linear to circular, from energy-driven to C-negative sustainable agricultural models

Bioenergy / Bioeconomy enabling more Sustainable Agriculture AND Carbon removal

Thanks for your attention

David Chiaramonti

Politecnico di Torino

david.chiaramonti@polito.it

Politecnico di Torino

1859

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